

CHAPTER 4

PROTECTIVE CLOTHING AND EQUIPMENT

Section I. DESCRIPTION AND USE

General

Whenever a potential or actual health hazard exists, the use of properly designed protective clothing and equipment is mandatory. This clothing should be impervious or resistant to the material being handled. Such protective clothing and equipment are issued for protection against hazards of handling liquid propellants. It is essential that these items be used when prescribed and that all propellant handlers be fully familiar with the correct procedures for wearing the clothing and operating the equipment. Protective clothing for handling liquid propellants is cataloged as rocket fuel handler's protective clothing.

Since protective clothing worn next to the skin may cause local irritation, propellant handlers should always wear suitable undergarments with the clothing. Rings, watches, and other metal objects should be removed before wearing protective clothing. The length of time protective clothing can be worn without impairing the efficiency of the wearer because of heating depends upon the prevailing temperatures and the individual's activity. Articles of protective clothing must never be worn long enough to restrict the efficiency of the operation or the safety of personnel. Refer to TB 10-227 for additional information on protective clothing.

Protective clothing will never be used as a substitute for conventional firefighting clothing.

The various items of protective clothing are as follows:

- (1) Boots.
- (2) Coveralls liner.
- (3) Hood liner.
- (4) Cotton coveralls (if required).
- (5) Breathing apparatus (M15).
- (6) Cotton hood (if required).
- (7) Gloves.

44. Rocket Fuel Handler's Boots (fig. 38)

These knee-length boots are made of special synthetic rubber that is acid- and fuel-resistant. They must be worn *under* the legs of the coveralls liner to prevent harmful liquids from entering them. Since the boots may irritate bare feet, socks should always be worn with them. When properly worn, the boots protect the feet from fuels and oxidizers.



Figure 38. Leg of coveralls liner rolled up to show fuel handler's boot.

45. Rocket Fuel Handler's Coveralls Liner (fig. 39)

The coveralls liner is a 1-piece garment made of olive-green, vinyl-coated glass cloth. It is impermeable to both fuels and oxidizers. A continuous zipper down the front of the garment has rubber lips which retard the entry of harmful agents once the zipper is closed. Zippers on the outer sleeve cuffs are used to close the cuffs over the gauntlet of the fuel handler's glove and the inner sleeve of the coveralls liner (fig. 41). The legs of the liner are worn over the fuel handler's boots. Suspension loops attached to the outer sleeve cuffs (fig. 41) are used to hang the garment up for air drying and storage. When properly worn, the coveralls liner offers protection for the arms, legs, and body in case of a major spill of propellants.

46. Compressed Air Breathing Apparatus M15 (fig. 40)

a. General. The compressed air breathing apparatus M15 is a self-container protective device which operates independently of the outside air. The M15 compressed air breathing apparatus is made of three major assemblies: as mask, a demand regulator, and a back pack.

- (1) *Mask.* The mask consists of a field protective facepiece assembly connected by a flexible breathing tube to a quick-connect fitting for attachment to the demand regulator.

Note. An airtight seal is made between the face and facepiece by adjusting the head band straps.

- (2) *Demand regulator.* The demand regulator consists of a demand valve assembly housed in a metal case, and a low-pressure hose which has threaded fittings at each end. A metal clip on the underside of the case holds the demand regulator in proper position when the apparatus is worn. One end of the low-pressure hose is attached to the demand regulator, and the other end is attached to the air supply.

- (3) *Back pack.* The back pack assembly includes two cylinders for holding compressed air. One cylinder is fitted with a high-pressure regulator, which has a pressure gage and a safety plug; the

other cylinder is fitted with a pressure-reducing regulator which has a safety plug, a relief valve, a charging fitting, a dust cup for the charging fitting, an outlet for the air supply, and a low-pressure hose. The low-pressure hose fits into the air supply outlet at one end and the demand regulator at the other end. The high-pressure regulator is connected to the pressure-reducing regulator by a high-pressure fitting assembly. The air supply cylinder is held in proper position by two straps and two strap clamp assemblies. The strap clamp assemblies also serve as means of attaching the harness to the air supply unit. The harness assembly is adjustable and is attached by shoulder straps and a waist

b. Operation. The air supply cylinder supplies air under a pressure of 2,100 pounds per square inch. The air passes under the pressure into the low-pressure hose. A normally closed, check valve at the inlet of the air delivered to the demand regulator through the low-pressure hose. When the pressure within the facepiece is reduced by the user's breathing, the check valve opens below the ambient atmospheric pressure, and causes the tilt valve to open and admit fresh air. Expired air passes from the mask through the outlet valve. Breathing is easy and requires no conscious effort. Positioning of expired air from the mask at the outlet, followed by the influx of fresh air on each inhalation, effectively clears the mask, venting condensation and fogging.

c. Safety Factors. Under conditions of extreme exertion or emotional stress, the ventilation rate will be higher, and duration of use will be lower. The minimum duration of use is 30 minutes at extreme exertion upon the physique, physical condition, psychological attitude of the user; the duration may become slightly difficult when the cylinder has dropped below 500 pounds per square inch. A reserve supply of air is still available to permit escape from a hazardous area.

d. Use. The apparatus is worn over the coveralls liner and is adjusted to proper fit and harness fittings.



Figure 39. Fuel handler's protective clothing.

7. Rocket Fuel Handler's Coveralls (fig. 39)

These 1-piece coveralls are made of olive-green terrycloth and may be used in warm weather.

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The garment is pulled on over the coveralls liner and adjusted to a comfortable fit. During use, a stream of water is sprayed over the coveralls and the resulting evaporation cools the wearer.

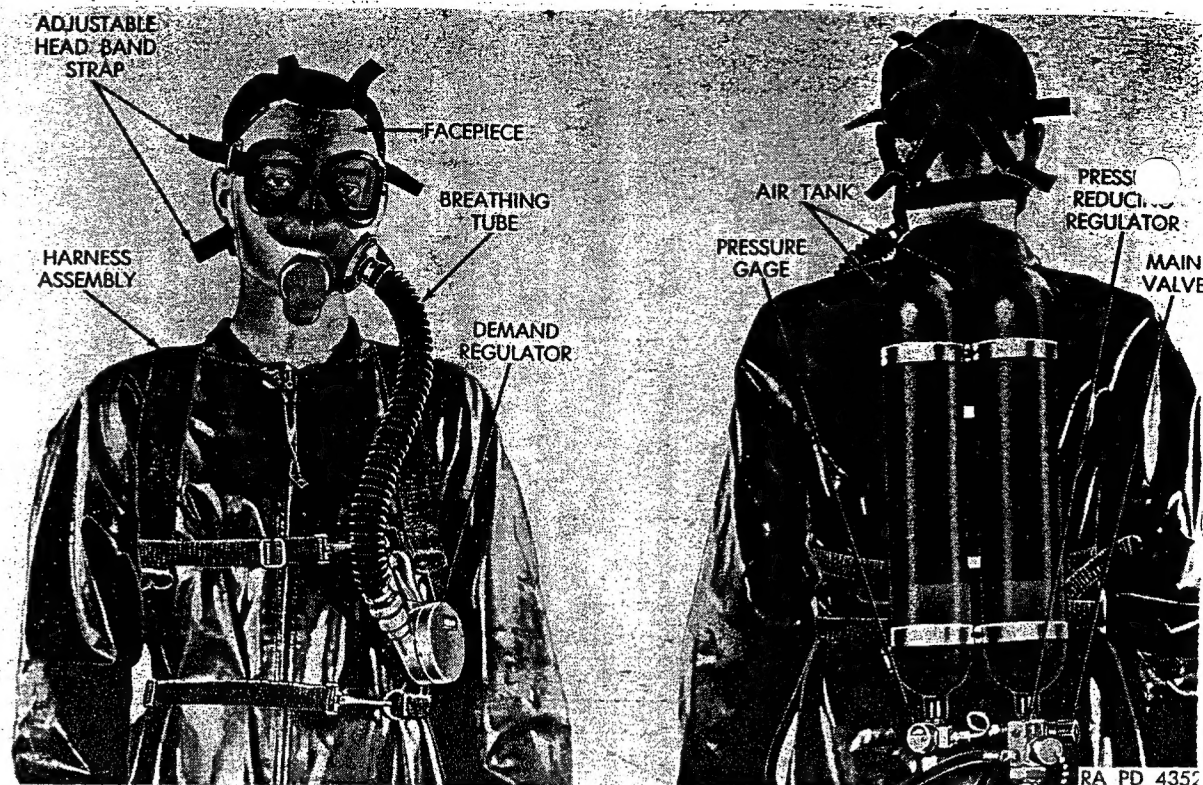


Figure 49. Compressed air breathing apparatus M15.

48. Rocket Fuel Handler's Hood (fig. 39)

The olive-green terrycloth hood may be used with the hood liner during warm weather to help cool the propellant handler by evaporation. The hood fits over the hood liner and is secured to it by snap fasteners around the transparent plastic visor.

49. Rocket Fuel Handler's Hood Liner (fig. 39)

The hood liner is made of olive-green, vinyl-coated glass cloth and has a curved transparent plastic visor. Attached to the inside of the hood liner is a rigid frame support with an adjustable headband. A knob on the headband permits adjustment to individual head size. The liner may be worn over the bare head or over a cap. A suspension loop fixed to the top of the liner is used to hang the liner for air drying and storage. When properly worn, the hood liner protects the face, head, and shoulders from fuels and oxidizers.

Note. The use of an antidim cloth or stick will reduce fogging of the visor when the hood is worn for extended periods of time.

50. Rocket Fuel Handler's Gloves (fig. 41)

These gloves are made of vinyl-coated cloth and are issued in two colors, green and black. The actual color of the gloves does not affect their use. Gloves must be marked to indicate the type of propellant they are to be used with. Gloves are worn with the gauntlet over the sleeve and are held in place by the outer edge of the coverall liner. When properly worn, gloves furnish protection for the hands and wrists against both fuels and oxidizers.

51. Miscellaneous Equipment

In addition to the articles listed above, a lead or galite apron and vaporproof safety goggles. A face shield of an approved type must be available to propellant handlers. Other items which may be required should have the approval of the safety officer.

52. Use of Protective Clothing and Equipment

Protective clothing and equipment must be worn as prescribed in table III for operations involving handling, decontamination, and disposal of liquid propellants.

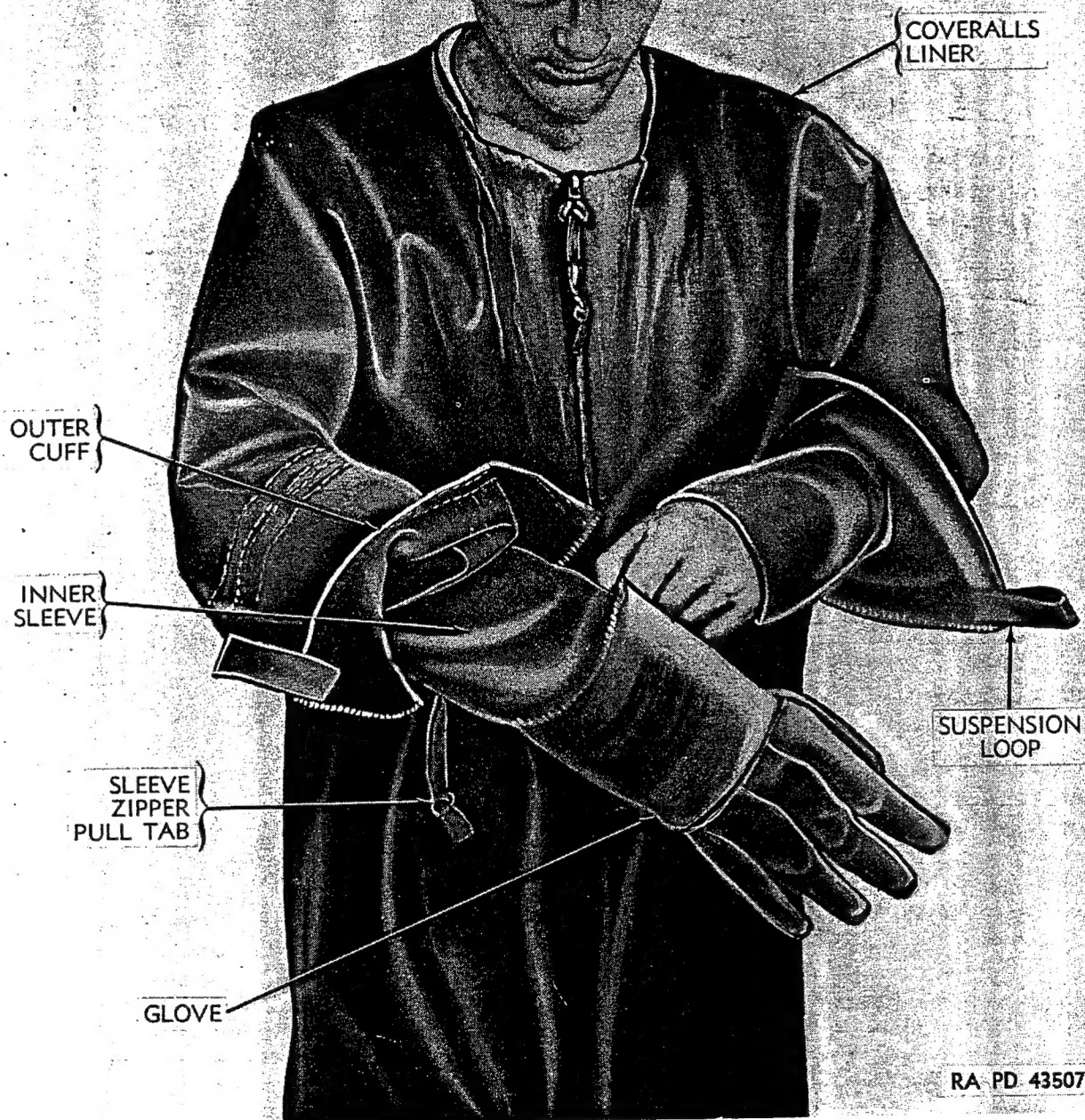


Figure 41. Fuel handler's glove.

Voir Fig 41.1. dans C₁

Table III. Use of Protective Clothing and Equipment

Operation	Protective clothing and equipment required						
	BOOT, rocket fuel handlers synthetic rubber, acid and fuel resistant.	LINER, rocket fuel handler's coveralls. COVERALLS, rocket handler's cotton olive-green.	LINER, rocket fuel handler's hood. HOOD, rocket fuel handler's outer, olive-green.	GLOVES, rocket fuel handler's vinyl-coated, acid-resistant.	Breathing apparatus M15.	Rubber or gralite apron.	Safety goggles or face shield.
<i>Handling Sealed Containers:</i>							
NITRIC ACID, GUIDED MISSILE (IRFNA).*				X		X	X
PROPELLANT MIXTURE, GUIDED MISSILE: M3.				X		X	
STARTING MIXTURE, GUIDED MISSILE; UDMH.*				X		X	
<i>Handling Liquid in Open Containers, Decontamination, and Disposal:</i>							
NITRIC ACID, GUIDED MISSILE (IRFNA).	X	X	X	X	X		
PROPELLANT MIXTURE, GUIDED MISSILE: M3.	X	X	X	X	X		
STARTING MIXTURE, GUIDED MISSILE: UDMH.	X	X	X	X	X		
<i>Handling Liquid in Laboratory Analysis:</i>							
NITRIC ACID, GUIDED MISSILE (IRFNA).						X	X
PROPELLANT MIXTURE, GUIDED MISSILE: M3.						X	X
STARTING MIXTURE, GUIDED MISSILE: UDMH.						X	X

* A full set of protective clothing will be immediately available at all sites at which fuels and oxidizers are handled.

Section II. CARE AND PRESERVATION

53. General

a. To obtain maximum benefit from protective clothing, all propellant handlers should be familiar with the methods of inspecting, decontaminating, and storing the clothing. Labels permanently attached to each item give instructions to the wearer on use and care. All personnel must be familiar with these labels and comply with the instructions on them.

b. Since liquid fuels and oxidizers coming in contact with each other could cause fire or injury to personnel, items of protective clothing in-

tended exclusively for use with fuels or oxidizers must be color coded to indicate their special use. (Fuels include propellant mixture M3 and starting mixture UDMH.) Items designated for use with fuels only should be marked with a single stripe of yellow paint as indicated in table IV. Those items for use with oxidizers only should be marked with a single stripe of green paint as indicated in table IV.

c. Methods of marking, inspecting, decontaminating, and storing protective clothing are listed in table IV.

Table IV. Care and Preservation of Protective Clothing and Equipment

Item	Marking	Inspection	Decontamination ¹	Storage ²
BOOT, rocket fuel handler's synthetic rubber, acid and fuel-resistant (or BOOT rubber, short, heavy, knee).	One stripe, upper edge of leg (yellow for fuels; green for acids).	Check surface for rips, holes, or signs of excessive wear. If fabric is exposed, boots are unserviceable.	PROPELLANT MIXTURE, M3 and UDMH; Soak in 5 percent acetic acid solution or strong vinegar. Rinse in water; scrub with soap and water; rinse and air-dry. IRFNA: Soak in 5 percent sodium bicarbonate solution. Rinse in water; scrub with soap and water; rinse and air-dry.	Allow to air-dry and store in clean place on dunnage at least 6 inches off floor.
COVERALLS, rocket fuel handler's cotton olive-green.	Mark with one stripe colored tape sewn on inside upper center back (yellow for fuels; green for acid).	Examine surface for rips, holes, torn seams, missing snaps. Small ($\frac{1}{2}$ -inch diameter overall) tears are allowable.	Follow instructions above, then launder in equipment designated for this purpose. Make sure garments are air-dried after laundering.	Allow to air-dry, then hang by suspension loop in clean dry place. Make sure bottom is at least 6 inches from floor.
GLOVES, rocket fuel handler's vinyl-coated, acid-resistant, green (or yellow).	One stripe in clearly visible position (yellow for fuels; green for acids.)	Check surfaces for rips, tears or signs of excessive wear. Pay particular attention to area between fingers. If fabric is exposed, gloves are unserviceable.	See BOOT, above-----	Allow to air-dry and store flat in clean dry place on dunnage at least 6 inches off floor.
HOOD, rocket fuel handler's outer, olive-green.	Mark with one stripe (sewn-on colored tape) inside lower center front bib (yellow for fuels; green for acids).	Examine cloth for tears, rips, holes, torn seams, missing snap fasteners. Small ($\frac{1}{2}$ -inch overall diameter) tears are allowable.	See COVERALLS, above----	See COVERALLS, above.
LINER, rocket fuel handler's coveralls.	One stripe, inside upper center back, in clearly visible position (yellow for fuels; green for acids).	SEAMS: Check all coated seams to make sure they are intact and protected by sealing coat. VINYL-COATING: Examine surfaces for holes, rips, signs of excessive wear, or exposed cloth fabric. SLIDE FASTENER: Make sure rubber lips cover the metal slide at all points and that slide operates properly.	See BOOT, above-----	Avoid sharp creases or folds in garment. See COVERALLS, above.

LINE hood, with plastic visor.	One stripe inside lower center front bib (yellow for fuels; green for acids).	SEALS: Check all coated seams to make sure they are not cracked or peeled. PLASTIC VISOR: Check for cracks and breaks. VINYL-COATING: Examine surfaces for holes, rips, tears, or signs of excessive wear, or exposed fabric. SNAP FASTENERS: Check to see that fasteners are present and workable. SUSPENSION LOOP: Check small nut on inside of liner which secures loop. Tighten if necessary.	See BOOT, above.	Protect from scratches. See COVERALLS, above.
MASK, oxygen, gas breathing, M15.	Do not use the same mask for fuels and oxidizers. Masks should be marked on some prominent surface in the front of the mask (yellow for fuels; green for acids).	FACEPIECE: Examine rubber surface for cracks, tears or hardening. Check lenses for cracks and tight fit to rubber portions. HEADBAND: Check for deterioration or excessive wear. BREATHING TUBE: Check for holes, tears, and cracks, especially around folds. PRESSURE GAGE: Check cylinder pressure on pressure gage. Always use a full unit. FITTINGS: Examine all fittings between breathing tube, valves, regulators, and clamp assemblies. Check facepiece for tight fit.	IRFNA: Wipe off contaminant; thoroughly sponge with 5 percent sodium bicarbonate solution. Sponge with clear water and allow to air-dry. FUELS: Wipe off contaminant; thoroughly sponge with 5 percent acetic acid solution. Sponge with clear water and allow to air-dry.	Allow to dry thoroughly after washing, and store at temperatures above 32° F. in cool dry place. Store in fiber-carrying case designed for mask.

¹ A 5-percent solution of acetic acid can be made by adding approximately one-half pound of glacial acetic acid (technical grade) to a gallon of water. A 5-percent solution of sodium bicarbonate can be made by adding one-half pound of sodium bicarbonate to a gallon of warm water.

² In no case will clothing used for fuels be stored with clothing used for oxidizers.

54. Washing

After each use, all articles of protective clothing must be thoroughly washed to remove contamination before re-use or storage to reduce the deleterious effect of the contamination on the clothing and to eliminate the probability of fire in case an incompatible substance comes in contact with the contaminated clothing. Impermeable garments can be effectively washed in a portable shower or by hose. Permeable clothing should be laundered (after decontamination) in specially designated equipment, using a strong solution of soap and water. After washing, each item must be completely air-dried in a well-ventilated place.

55. Repairing Protective Clothing

Protective clothing will be repaired only by qualified personnel. Individual propellant handlers, however, may apply tape around the borders of the plastic visor of the hood liner if it is lacking. The following procedure will be used:

- a. Unsnap and turn back coated-fabric retaining piece around edges of visor.

- b. Measure amount of tape needed to surround borders of visor and apply 2-inch wide (Minnesota Mining and Manufacturing Company, Black Scotch-type, No. 472 or equivalent) around visor so that half of width sticks to visor and half to coated fabric.

- c. Fold coated fabric retaining piece back into position and refasten snaps.

56. Disposition of Unserviceable Clothing and Equipment

Unserviceable protective clothing and equipment will be turned in promptly through normal supply channels for repair or replacement. Items must be decontaminated prior to turn-in.

57. Basis for Issue

All items of protective clothing and equipment are issued in accordance with applicable regulations and AR 385-32.

58. References

Additional information on protective clothing can be found in TB 10-227 and TB MED 307.

CHAPTER 5

CARE, HANDLING, AND STORAGE OF MISSILE COMPONENTS

Section I. GENERAL SAFETY PRECAUTIONS

59. General

This section is concerned with dangers in handling and decontamination of NIKE-AJAX missile components. General handling precautions for explosives are also listed in TM 9-1903.

60. Fire Prevention

a. Good housekeeping is of paramount importance and should be stressed as the most important factor in fire prevention. In this respect, precautions should be taken to keep the vicinity free from oil and other organic materials which readily ignite when in contact with nitric acid. Any spilled acid should be immediately neutralized to lessen the possibility of fire.

b. Frequent periodic inspections for the express purpose of detecting and removing any fire hazards should be conducted in all buildings or areas where acid is stored.

61. Fire Protection

a. The water supply to areas where nitric acid is stored or handled shall be adequate to extinguish or control fires which may result from spilled acid. Adequate outlets, in the form of fire hydrants, hoses, or automatic sprinkler systems, must be immediately available to each site or building. Fire extinguishers should be available as required.

b. The duties of guards, watchmen, and other personnel should be so arranged that a firefighting force is available at all times. Firefighting

forces should be instructed in the hazards, the safety precautions to be taken, and the means and methods to be used in preventing and fighting fires involving this acid.

62. Fires Involving Explosive Components and Liquid Propellants During Transportation

Drivers of vehicles transporting explosive components must be informed of the nature of their cargo and its potential fire hazards. In addition, drivers must be told of the proper methods of firefighting and special precautions to be observed. Drivers of vehicles carrying liquid propellants must be warned of the explosive and toxic nature of their cargos and of the proper protective measures which must be observed by firefighters. For further information on fires involving explosives and liquid propellants, see AR 55-225. Specific instructions are given in this chapter for fighting fires involving the liquid propellants.

63. First Aid Measures

This paragraph deals only with accidents requiring special first aid procedures. In general, liquid propellants present the greatest health and safety hazards. For this reason all personnel handling the fuels and oxidizer must be familiar with the first aid procedures to be followed in case of an accident involving these chemicals. Table V gives first aid for accidents involving missile components. In case of accident, medical aid should be called immediately.

Table V. First Aid for Accidents Involving Missile Components *Join C₂*

Hazards	Swallowing liquid	Inhalation of vapors	Eye, ear, or skin contact
BATTERY, STORAGE: BB-401/U (Electrolyte).	Give casualty copious amounts of water. Immediate medical attention is necessary.		Irrigate eyes with water. Flush contaminated skin with 2-percent boric acid solution.
NITRIC ACID, GUIDED MISSILE: (IRFNA).	Give casualty liberal amounts of fresh water or bicarbonate of soda solution (two tablespoons to a pint of water). Do not force vomiting. ¹ Immediate medical attention is necessary.	Remove casualty from contaminated atmosphere and summon immediate medical aid. ²	Flush contaminated eyes for 15 minutes with water. Flush contaminated skin areas with cool water or copious amounts of 5-percent bicarbonate of soda solution for 15 minutes. Immediate medical attention is necessary. ³
PROPELLANT MIXTURE GUIDED MISSILE: M3.	Induce vomiting by giving casualty large amounts of warm water. Obtain medical attention immediately.	Remove casualty from contaminated atmosphere into fresh air and summon immediate medical aid. ⁴	Irrigate eyes irritated by vapor or liquid with warm water for 15 minutes, holding lids apart if necessary to obtain complete flushing. Apply boric acid ointment (ophthalmic) and immediately refer casualty to an eye physician. Remove contaminated clothing and flush contaminated skin areas with large amounts of water, or 5-percent solution of acetic acid or vinegar for 15 minutes. ⁵
STARTING MIXTURE, GUIDED MISSILE: Unsymmetrical dimethylhydrazine.	See PROPELLANT MIXTURE, GUIDED MISSILE: M3.	See PROPELLANT MIXTURE, GUIDED MISSILE: M3.	See PROPELLANT MIXTURE, GUIDED MISSILE: M3.

¹ Do not induce vomiting because of the danger of rupturing the esophagus and stomach.² Keep casualty in bed and warm for 24 hours. Give oxygen under proper supervision if respiratory rate is above normal, to increase oxygenation of blood and to combat the development of pulmonary edema. For further information on medical treatment, see TB MED-242.³ Remove and immerse contaminated clothing in saturated bicarbonate solution.⁴ Give oxygen, if necessary, under proper supervision. For information on administration of oxygen, see TB MED-242.⁵ Immediately remove and thoroughly wash contaminated clothing with large quantities of water followed by air-drying.

Section II. GENERAL STORAGE INFORMATION

4. General

Good storage practices protect components from the elements and are in accordance with safety procedures. Protection from the elements includes the use of substantial dunnage and the provision of adequate shelter and ventilation. Careless handling and deterioration of components during storage may result in fires or explosions. On the other hand, compliance with safety procedures will reduce the probability of accidents to personnel and materiel during storage.

65. General Storage Precautions

a. Categories. For storage purposes, components are grouped into three categories: explosive, nonexplosive, and liquid propellant.

b. Explosive Components. The precautions found in TM 9-1903 apply to the storage of missile explosive components.

c. Nonexplosive Components. Nonexplosive items should be stored in cool, dry, fire-resistant

warehouses, magazines, or shed-type structures. Open storage is permissible if containers are protected by flame-resistant paulins or other suitable covering. Paulins or covering should be arranged to allow at least an 18-inch space for ventilation. Further information on open storage can be found in TM 9-1903 and TM 38-402.

d. Liquid Propellants. Fuels and oxidizers should be stored in transitory or permanent-type shelters respectively described in paragraphs 77 and 78. The general storage precautions found in TM 9-1903 apply to liquid propellants.

66. Quantity-Distance and Storage Compatibility

a. Explosive Components. Missile explosive components should be stored in accordance with the quantity-distance and compatibility tables of TM 9-1903. See table VI, of this manual for quantity-distance classes, compatibility groups, and special handling instructions for specific explosive components.

Table VI. Quantity-Distance Classes, Compatibility Groups, and Special Handling Instructions for Explosive Components

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Component	Quantity-distance class	Compatibility group	Special handling instructions
EXPLOSIVE HARNESS ASSEMBLY, GUIDED MISSILE: M24 and M45.	10	B, I	Sensitive to heat, friction, and impact and may detonate when burned in large quantities. Do not drop, slide, or drag containers over floors or other containers.
IGNITER, JATO, ELECTRIC, M24	10	O	Sensitive to heat, impact, friction, and static charge. Never attempt to disassemble igniter. Do not circuit test while assembled to jato. Collect loose explosive from leaking igniters and dispose of it in accordance with local standing operating procedures and safety regulations. Keep shorting plug in place except when igniter is installed in jato or undergoing test.
JATO UNIT: M5 *	10	F	Handle with care since propellant grain is fragile and susceptible to damage by rough treatment. Always lift unit at two points with total bearing surface of at least 12 inches. See TM 9-1955 for further instructions.
SAFETY AND ARMING DEVICE, GUIDED MISSILE: M27, M30 AND M30A1.	3	B	Avoid all rough handling as devices contain delicate clockwork mechanisms.
WARHEAD, GUIDED MISSILE: M2, M3, AND M4.	10	G	Electric powered lift for handling is recommended. Keep handling and number of operating personnel to a minimum. Lift uncrated warheads with special warhead handling yoke.

* The jato unit has an interim storage life of 5 years maximum, based on normal storage conditions with temperatures between minus 20° and plus 130°F. The jato unit should never be exposed to temperatures below minus 65°F. for any period of time.

b. *Liquid Propellants.* The missile fuels and oxidizer are grouped together in quantity-distance class 150. Information on this class is included in table IX. Information on compatibility grouping can be found in TM 9-1903. Fuels and oxidizers must not be stored together. *Not C4*

67. Combination (Mixed) Storage

a. With the exception of the liquid propellants, the missile components may be stored in accordance with table VII. The intermagazine distance and safety distance to inhabited buildings, public railways, public highways, and navigable streams will be those specified for the most hazardous class of material stored.

b. In table VII, X indicates that components may be stored together. An O indicates that components may be stored together if the total explosive content does not exceed 1,000 pounds net. A blank intersection denotes that components cannot be stored together. Mixed storage, as shown in this table, is permitted only if components are packaged according to approved Ordnance Corps drawings.

Table VII. Combination (Mixed) Storage of Explosive Components.

Component	Explosive harness assembly, guided missile: M24 and M45.	Igniter, jato, electric, M24	Jato unit: M5	Safety and arming device, guided missile: M27, M30, and M30A1.	Warhead, guided missile: M2, M3, and M4.
EXPLOSIVE HARNESS ASSEMBLY, GUIDED MISSILE: M24 and M45.	X	O		O	O
IGNITER, JATO ELECTRIC, M24.*	O	X		O	O
JATO UNIT: M5*	O	O	X	X	O
SAFETY AND ARMING DEVICE, GUIDED MISSILE: M27, M30, AND M30A1.					
WARHEAD, GUIDED MISSILE: M2, M3 AND M4.	O	O		O	X

* Jato units and igniters can be stored together when these items are packaged together.

68. Safeguarding Classified Missile Components

a. The safeguarding of missile components classified for handling, shipping, and storage is the responsibility of commanding officers. All classified components will be handled, stored, and shipped in accordance with AR 380-55 and AR 55-225.

b. The following security measures are suggested for the storage of classified components:

- (1) Preferred storage is in standard or igloo-type magazines meeting quantity-distance requirements.
- (2) No classified components should be stored in magazines with unclassified components. However, should necessity require that compatible classified components be stored in the same magazine with unclassified components, the magazine will be secured in accordance with the highest classification it contains.
- (3) Storage of classified inert materiel (bulky) should be in warehouses or restricted standard magazines whenever possible. If open storage is necessary, the items must be placed in a restricted area, guarded, and checked periodically.
- (4) All doors to structures containing classified items should be provided with special locks, the keys to which are controlled and entrusted only to individuals having a need to enter the structures. All individuals entering such structures must have a security clearance equal to that of the highest classified item in the building. All keys to locks on structures containing classified materiel should be kept in a safe or a filing cabinet having a combination lock. A complete and accurate register should be maintained of all personnel issuing and receiving such keys.
- (5) The locks on all storage shelters containing classified materiel should be checked periodically.

Section III. STORAGE OF COMPONENTS

69. Explosive Components

For magazine storage drawing file numbers, see SM 9-5-1336. Table VII gives quantity-distance classes, compatibility groups, and special

handling instructions for missile explosive components. Table VIII lists the time a jato M5 can be exposed to various outside temperatures. Temperatures should not go below the minimum safe firing temperature. *Voia C1*

Table VIII. Jato M5 Safe Firing Temperatures *Voia C1*

Outside temperature	Safe firing temperature limit	Initial temperature of jato				
		75° F.	60° F.	45° F.	30° F.	15° F.
Minus 10° F.	Plus 10° F.	24.8 hr	20.8 hr	16.2 hr	9.8 hr	1.0 hr
	0° F.	38.3 hr	34.4 hr	29.8 hr	23.3 hr	14.5 hr
Minus 20° F.	Plus 10° F.	19.4 hr	16.0 hr	12.2 hr	7.0 hr	0.9 hr
	0° F.	27.3 hr	23.9 hr	20.1 hr	15.0 hr	8.6 hr
Minus 30° F.	Plus 10° F.	16.9 hr	13.0 hr	9.8 hr	5.2 hr	0.7 hr
	0° F.	22.5 hr	18.6 hr	15.4 hr	11.1 hr	6.1 hr
Minus 40° F.	Plus 10° F.	13.6 hr	11.1 hr	8.0 hr	4.0 hr	0.5 hr
	0° F.	18.1 hr	15.4 hr	12.5 hr	8.9 hr	4.8 hr
Minus 50° F.	Plus 10° F.	12.0 hr	9.6 hr	6.8 hr	3.1 hr	0.3 hr
	0° F.	15.8 hr	13.2 hr	10.6 hr	7.4 hr	3.9 hr
Minus 60° F.	Plus 10° F.	10.4 hr	8.3 hr	5.7 hr	2.1 hr	0.2 hr
	0° F.	13.6 hr	11.5 hr	9.2 hr	6.3 hr	3.2 hr

* Estimated since windchill does not develop instantly.

Note. The same length of time required to cycle a jato M5 from a high to low temperature is required to return the jato to the high temperature.

70. Nonexplosive Components

File numbers for storage drawings of nonexplosive components other than the battery and liquid propellants are listed in SM 9-5-1410. Those for the battery are listed in SM 9-5-6100. For information on storage drawings for liquid propellants, see paragraph 75. Storage requirements and limits and special handling instructions for individual components are given in subsequent paragraphs.

71. Guided Missile Body M2 and XM2

a. *Storage Requirements and Limits.* Since the body contains delicate electronic components sensitive to both temperature and humidity, it should be placed in covered storage. Although the shipping container for the body is designed for open storage, every effort should be made to store bodies under cover to lessen the danger of damage due to environmental conditions. If open storage is necessary, the containers must be protected from the elements by paulins or other suitable covering. Such storage areas should have hard and level surfaces, should be

well-drained, and should have adequate drainage breaks. Containers may be stacked in magazines or warehouses having floors able to support such weight, provided no danger of toppling exists. Loaded containers stored the open or on earth floors must not be stacked more than two high. *Voia C2*

b. *Special Handling Instructions.* Because of the size and weight of the loaded container, extreme care must be taken in handling. Operations involving the lifting and stacking of containers with forklifts must be supervised closely to prevent possible damage to the bodies.

72. Storage Battery BB-401/U

a. *Storage Requirements and Limits.* The battery must be stored base down in magazines or warehouses, and within the temperature range of -80° to +160° F. It can be stored under these conditions for two years; and it may be stored with electrolyte, charged or uncharged, or charged and stored in continuous (float) charge.

Voia C2

b. *Special Handling Instructions.* The electrolyte used in this battery is a caustic liquid and will produce serious burns if it comes in contact with the skin.

73. Stabilizer Fin M9 and Control Fin M10; Thrust Structure M2; and Jato Fin M12

a. *Storage Requirements and Limits.* These items may be stored in any quantity and in any suitable structure. Open storage is permissible provided adequate dunnage and paulin or other suitable covering is available.

b. *Special Handling Instructions.* The surfaces of the fins are critical and care should be taken not to puncture or otherwise damage the crates in such a way as to harm the contents.

74. Delay Lines, GS 15666 and GS 17194 Series; and Antenna, GS 18114 Series

a. *Storage Requirements and Limits.* These items are classified CONFIDENTIAL for storage and shipping and must be handled in accordance with AR 380-55 and AR 55-225. See also paragraph 68.

b. *Special Handling Instructions.* The delay lines and antennas GS 18114 series are components of the missile electronic system and should be handled carefully to avoid damage. The delay lines must be handled so as to avoid exposure to moisture. The antenna must be handled carefully to avoid cracking or breaking of the mica disc in its base.

Section IV. STORAGE OF LIQUID PROPELLANTS

75. General

The liquid propellants are usually stored in transitory-type shelters (permanent-type shelters are in use at some installations) in accordance with special quantity-distance and compatibility requirements. File numbers of storage drawings for fuels and oxidizers are listed in SM 9-5-1375.

76. Fire Prevention

Good housekeeping is essential and must be stressed as an important factor in fire prevention.

a. UDMH must be stored in areas free of all combustible materials. A UDMH spill must be immediately flushed with water to minimize the possibility of fire. Open fires and other sources of sparking must be avoided in handling UDMH. Explosionproof wiring, lighting, and motors are required for areas in which this chemical is to be handled or stored.

b. Propellant mixture M3 is highly flammable and flashes at a low temperature. All metal equipment in which the fuel is handled should be electrically grounded. Smoking, open flames, sources of sparks, and excessive heat should be prohibited from areas where the fuel is handled or stored. All permanent electrical wiring installed in areas where fuel is stored or handled will be contained in rigid metal conduits, and electrical accessories will be of the explosion-

proof type. Where temporary portable electric lines or extension cords are needed, they must be explosionproof, have heavy-duty nonsparking insulation, and must be inspected before each use for flaws and defects. All electrical equipment should be inspected periodically and maintained in proper working condition.

c. Nitric acid will not burn. However, precautions should be taken to keep the vicinity free from oil and other organic materials which readily ignite in contact with nitric acid. Any spilled acid should be neutralized immediately to lessen the possibility of fire. Frequent, scheduled, periodic inspections for the express purpose of detecting and removing any fire hazards should be conducted in all buildings or areas where acid is stored.

77. Transitory Shelter (fig. 42)

This shelter is constructed with a steel framework and of noncombustible materials. The sides and roofing are of aluminum, and all bolts or connectors are of a type which permit dismantling and re-erection. The siding must extend from 2 feet above the ground level to 1 foot below the eaves to allow continuous ventilation to reduce the concentration of propellant vapors. The interior clear height must be at least 9 feet. A warning sign stating the name of the propellant, its hazards, and the protective clothing and equipment prescribed will be posted at the en-

trance to each shelter. For further information on warning signs, see paragraph 85c. The width of the shelter may be either 20 or 40 feet. If the width is 40 feet, there must be two 20-foot sections with a row of interior columns or studs on the center line. Outward-swinging aluminum doors with antipanic catches must be provided in each 20-foot end section. The length can vary in 20-foot increments. If the length of the shelter exceeds 60 feet, a door should be located in the center of each side. These doors should be approximately 6 feet wide and 9 feet high. The entire floor should be crushed rock, gravel, or earth stabilized with plastic cement. The shelter must be provided with an adequate lightning protection system, firefighting equipment, and decontamination equipment including safety showers. For further information on required decontamination equipment, see paragraph 83. All electrical equipment installed must meet the requirements of paragraph 79g.

Note. In shelters of this type used for storing oxidizers, certain modifications must be made. The materials used must be resistant to the actions of acid vapors. The use of wood or other carbonaceous materials affected by contact with acids and acid vapors should be kept to a minimum. Floors should be of acid-resistant materials sloped to a drain connected to sumps. Drains from the sumps should not be connected to industrial and sanitary sewers. In lieu of drains, floors may be con-

structed with acidproof retaining walls to prevent escape of acid should leaks occur. Earth floors of the shelter should be diked and must consist of a 6-inch layer of well-crushed (sized from 1 inch down, with not more than 10 percent limedust) and graded lime. The exposed steel framework must be coated with acid-resistant paint. Since gaseous oxides are heavier than air, hoods and down-draft exhaust systems should be used where natural ventilation is inadequate. No lightning protection system is necessary.

78. Permanent Type Storage Structures Liquid Propellants (fig. 43)

Permanent storage structures for liquid propellants are constructed of a riveted steel framework and noncombustible materials. The framework structures are coated with acid-resistant paint. Outward-swinging aluminum doors with antipanic catches are provided at the center of each end and one single door to the right side of each end. Continuous ventilation is provided through the use of louvers at the top and bottom of the sides. An applicable warning sign will be posted. The floors are constructed of 6-inch concrete slabs on a tamped fill. The slabs are poured monolithically and have a 1/4-inch sparkproof finish. Adequate quick-opening showers are constructed in each building at the front and rear entrances. A covered dr

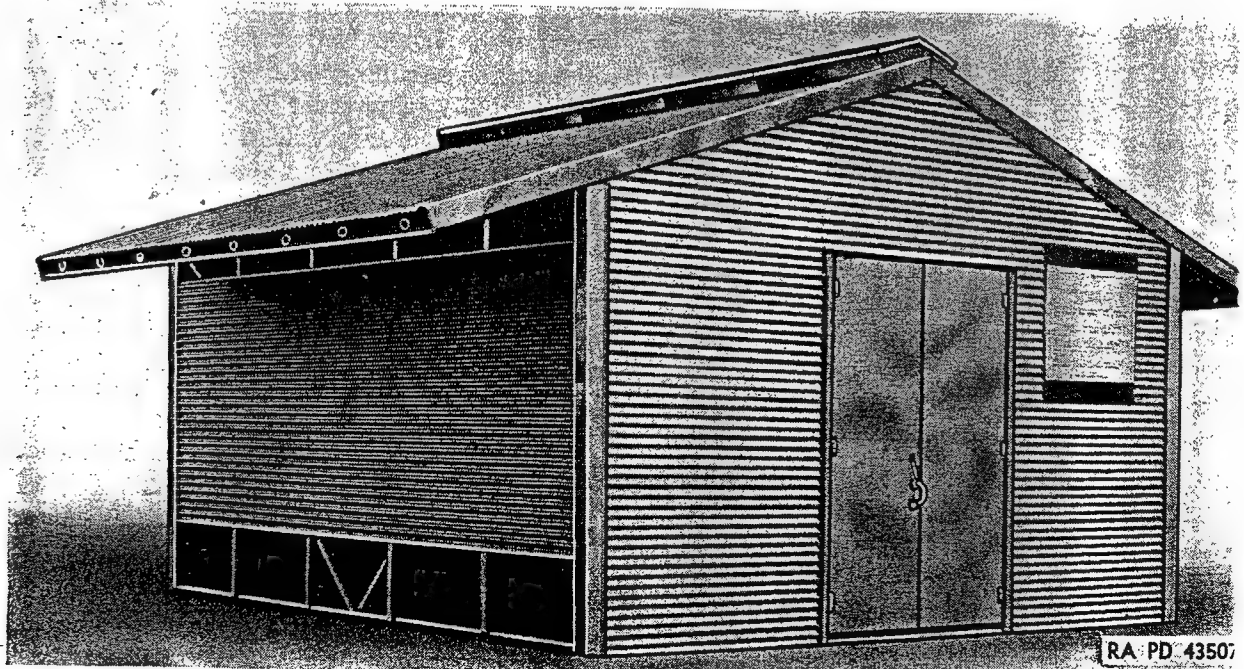


Figure 42. Transitory shelter for liquid propellants.

age ditch surrounds each shelter. Each structure is provided with firefighting and decontamination equipment. For further information on required decontamination of equipment, see paragraph 97. All electrical equipment installed must meet the requirements of paragraph 79g.

Note. The fuel structure is equipped with adequate lightning protection. The oxidizer structure has extra louvres at the front and rear and a louvred gable extending the entire length of the building to insure more complete ventilation. The drainage ditch around the oxidizer storage structure is practically filled with crushed limestone. Outward swinging aluminum doors with antipanic catches are required at the center of each side of all structures 100 feet in length or longer.

79. Selection and Construction of Storage Sites

Several factors govern the location of sites for the storage of liquid propellants. So far as possible, sites should be selected which conform to the following:

a. Avoid placing sites up-slope from inhabited or intensely used areas, or on high ground adjacent to valleys or hollows containing such areas. A distance of 1 mile should separate the site from these areas.

b. Avoid placing sites within 1 mile of the prevailing windward side of inhabited or intensely used areas. Unless unavoidable, no site should be placed closer than one-half mile to administrative areas, hospitals, shops, or housing regardless of the prevailing wind direction or ground slope.

c. Avoid placing sites within 1,500 feet (400 feet for UDMH if packaged in accordance with par. 40) of watersheds, reservoirs, lakes, or streams which are used as sources of drinking water or places of public recreation.

d. Avoid placing sites in areas near woods where dead leaves are not removed and where firebreaks cannot be maintained.

e. Select an area, if possible, which is accessible by railroad, all-weather road, water main, electric power line, telephone line, and sanitary sewage system.

f. If the installation of water hydrants is impracticable, portable equipment, such as a fire truck, tank truck, or trailer will be maintained in a standby status within the area to provide water for first aid, decontamination, flushing, and firefighting during all handling operations.

g. Install all permanent electric circuits in storage shelters within rigid metal conduits, and use only explosionproof equipment in fuel storage buildings.

Note. If temporary portable electric lines are used, make sure they are of the explosionproof, heavy-duty type with nonsparking insulation. These lines should be approved by the local safety officer and should be kept in good repair. *Vain C₁ pour additif?*

80. Operations Permitted Within Storage Shelters

The following operations are permitted in storage shelters:

a. Operations incident to storage.

b. Operations incident to inspection or sampling.

c. Operations incident to shipping such as replacement of damaged or loose strapping on boxes, stenciling of containers, and sealing of drums or crates.

81. Special Equipment and Handling Instructions for Fuels and Oxidizer

The equipment selected to handle liquid propellants must be approved for loads in excess of those actually handled so as to prevent any dropping or undue rough treatment.

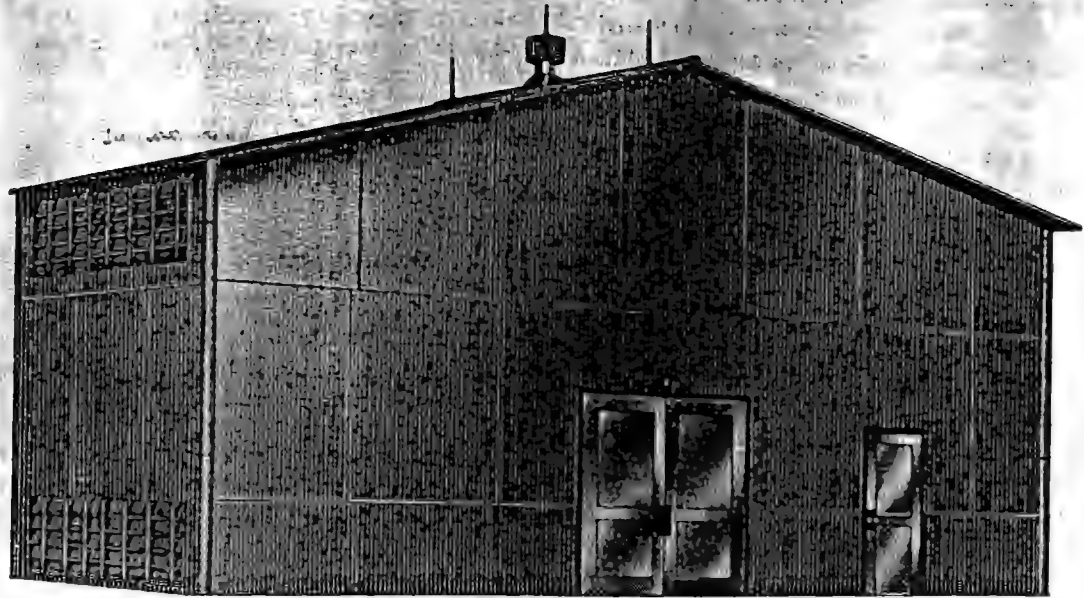
a. Forklifts of a 2,000-pound capacity, either gas or electrically powered (~~battery powered only for handling propellant mixture~~), are recommended. Gas powered forklifts must be equipped with spark and flame arresting mufflers. Each machine should have a 4-pound capacity carbon dioxide fire extinguisher.

b. Steel or aluminum bridge plates strong enough to support anticipated loads may be used for the passage of equipment to and from platforms, boxcars, or vehicles. These plates should have raised sides and lugs or angle irons on the underside to prevent slippage.

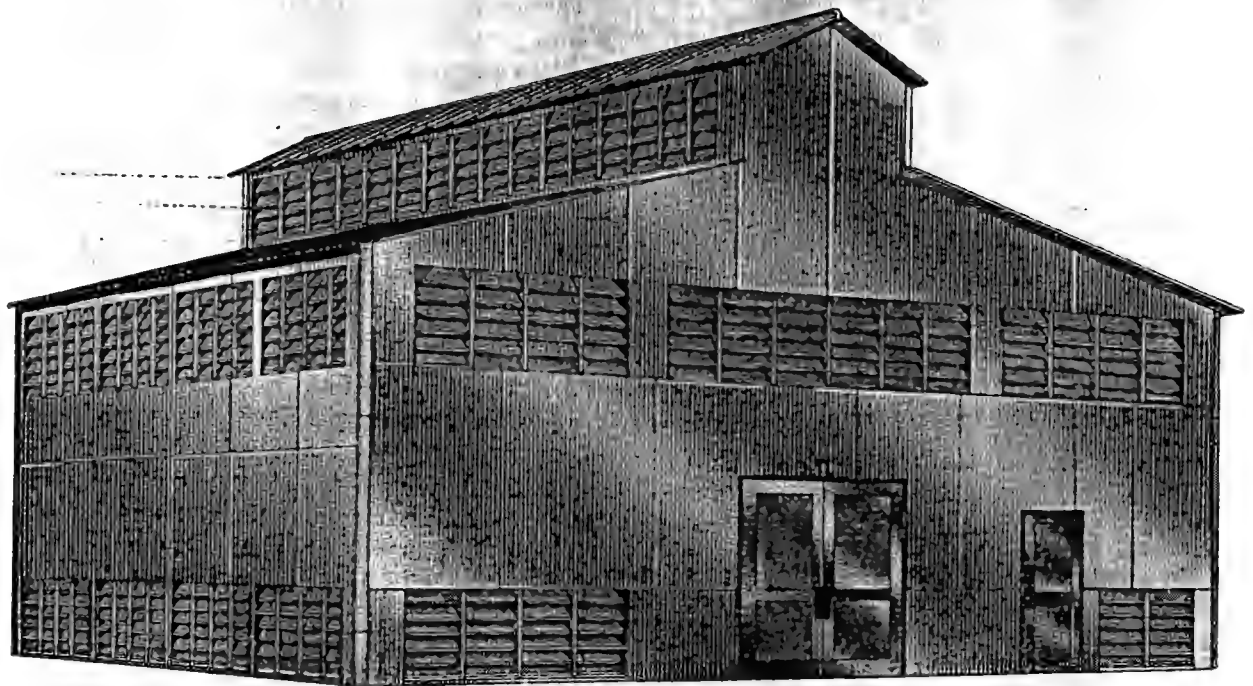
c. Approved hand trucks of either the 2-, 3-, or 4-wheel type, especially designed for handling cylindrical objects or acid drums, may be used as required.

d. Approved conveyors and similar handling equipment are also authorized.

e. Inspection and maintenance of handling equipment shall be performed in accordance with TM 9-2810.



FUEL M3 AND UDMH



OXIDIZER

RA PD 435715

Figure 43. Permanent type storage structures.

82. Special Precautions

a. Proper indoctrination of personnel in the potential hazards involved in handling liquid propellants is essential to the local safety program. All work done with these propellants must be supervised by responsible and trained personnel.

b. Liquid fuels must *never* be stored with oxidizers.

c. Smoking, lighters, matches, and open flames are prohibited in all liquid propellant storage areas.

d. Food should not be taken into storage areas where it may become contaminated by fumes or vapors.

e. If fuel or oxidizers, are transferred from one container to another, a closed system should be used. Fuel containers must be grounded during transfers. Care must be taken to insure that liquid propellants and containers are compatible.

f. All leaking containers must be reported to proper authority immediately, and contents transferred or destroyed.

g. Medical, fire, and safety personnel must be notified when any hazardous operation involving liquid propellants is planned.

h. Approved safety tools. *must be used.*

83. Safety Equipment

During operations involving the handling of liquid propellants, the following items of safety equipment will be available at all sites, as applicable (all percentages are approximate):

a. Treadle-operated, deluge-type safety shower or equivalent (water truck with motor running and hose with spray nozzle in ready position).

b. Eye fountain or equivalent (garden hose with water running).

c. Ten-gallon open container of 5-percent solution of sodium bicarbonate (baking soda) for skin decontamination of IRFNA.

d. Five-gallon open container of 5-percent solution of commercial acetic acid (or strong vinegar) for skin decontamination from starting mixtures or guided missile propellant mixture M3.

e. Fire extinguishers of an approved type.

f. Woolen blankets.

84. Quantity-Distance Class 150 Limits

Quantity-distance limits for the storage of hazardous materials are necessary to limit damage in case of mishap to a predetermined quantity of involved material. They are also established to prevent damage to unrelated material and property, and to protect human life. To provide adequate protection in the storage of liquid propellants, two factors are considered: protection from outside exposures; protection of other sites from exposure to the item stored.

a. *Protection From Outside Exposures.* Sites for the storage of quantity-distance class 150 liquid propellants will be separated from other ammunition and explosives storage and operating areas, depending on the class and quantities of explosives involved in the other areas, as follows:

- (1) Class 2—Inhabited building distance.
- (2) Class 2A—Inhabited building distance.
- (3) Classes 3, 4, 5, 6, and 7—Inhabited building distance.
- (4) Classes 8, 9, 10, and 950—Public railway distance. (When weight of explosive does not exceed 250,000 pounds, the distance may be reduced 50 percent when barricaded but not below 1,200 feet.)
- (5) Appropriate distances, as specified in TM 9-1903 for other installations, from explosives burning and demolition grounds, classification yards, suspect car spurs, truck inspection stations, aircraft landing strips, etc.
- (6) A minimum of 400 feet in cases not covered above.

b. *Protection of Other Sites From Exposure to Item Stored.* NIKE-AJAX liquid propellants are included in quantity-distances class 150 and storage compatibility groups as follows: IRFNA group PA; UDMH group PC; and Guided Missile Propellant Mixture M3 group PC. Distances applicable to the storage of these items that afford protection to other sites are as follows:

- (1) Since the danger area caused by toxic fumes from these propellants depends upon climatic conditions, especially wind direction, no specific distance which will assure complete protection can be established. Adequate personnel

protection will be afforded if storage sites are located 2,500 feet from administration, housing, or shop areas. However, a minimum of 400 feet will separate propellant storage areas from inhabited buildings, inert storage and operating areas, public railways and highways, and reservation boundaries.

- (2) Sites for the storage of quantity-distance class 150 propellants in different compatibility groups will be separated by a minimum of 100 feet.
- (3) Oxidizer storage sites must be separated from fuel storage sites by the prescribed minimum distance listed in table IX.

Table IX. Class 150 Quantity-Distance for Storage of Fuels and Oxidizers

Pounds		Magazine distance (feet)— minimum distance between oxidizer and fuels or other combustible materials
Over	Not over	
0	2,500	100
2,500	10,000	150
10,000	100,000	200
100,000	300,000	300
300,000	Unlimited	400

85. UDMH

a. *Storage Requirements.* Containers of UDMH will be stored in such a manner that containers can be easily inspected or removed for sampling. A temperature below the boiling point (146° F.) of UDMH should be maintained at all times in shelters storing this fuel, and 120° F. should be considered a peak temperature to be avoided for sustained periods.

b. *Compatibility.* UDMH is compatible for storage with anhydrous ammonia, anhydrous hydrazine, hydrazine hydrate, and M3 fuel.

c. *Warning Signs.* A warning sign similar to that in figure 44, should be posted at each entrance to a shelter storing UDMH. Suggested dimensions and color scheme for this sign are 36 inches wide and 41 inches high with a white background and black lettering. The top of the sign should have a 2-inch stripe of brown paint superimposed on a 4-inch stripe of yellow paint positioned as indicated in figure 44. Lettering and spacing on the sign should be proportional

UNSYMMETRICAL DIMETHYL HYDRAZINE STORAGE

TOXICITY—TOXIC BY INHALATION OF VAPORS OR ABSORPTION OF THE LIQUID THROUGH THE SKIN. CAN BE FATAL.

FLAMMABLE—REACTS VIOLENTLY WITH MOST OXIDIZING MATERIALS. BURNS LIKE GASOLINE. MAY EXPLODE.

EXPLOSIVE—VAPORS ARE EASILY DETONATED.

PERSONAL PROTECTION—PRESCRIBED PROTECTIVE CLOTHING AND EQUIPMENT MUST BE WORN.

OFF LIMITS
TO UNAUTHORIZED PERSONS

Figure 44. Suggested warning sign for UDMH storage structure.

to the overall size of the sign. In addition to this warning sign, each shelter storing UDMH must be posted with a fire symbol 1 inch in diameter with TM 9-1903.

d. *Special Handling Instructions.* Proper training of personnel responsible for handling UDMH is essential. Personnel should be thoroughly familiar with the handling and storage hazards of the item and should be well instructed in decontamination and disposal procedures and first aid methods. Containers of UDMH must be handled carefully at all times. During transfer operations, handling equipment and containers must be electrically grounded. In all operations involving the handling of UDMH, personnel will wear appropriate protective clothing. Recommended minimum protective clothing for various operations is listed in table III.

e. *Firefighting.* Fires involving UDMH present a dual hazard: the vapors are highly flammable and form an explosive mixture with air. Large amounts of water fog have proven to be the most effective means of fighting fires of this nature, and

minimum of two volumes of water per volume of UDMH is necessary for effective control and extinguishment. Water spray is also recommended. Carbon dioxide is effective, but chemical foams and carbon tetrachloride are not recommended. All fire fighters and personnel within 1,000 feet of the fire must wear full protective clothing and self-contained breathing apparatus. For further information on protective clothing, see table III. Firefighting should be conducted when possible from the upwind direction.

86. Guided Missile Propellant Mixture M3

a. *Storage Requirements.* Drums will be stored on their original shipping pallets with bungs up, and away from the direct rays of the sun, open flames, and excess heat.

b. *Compatibility.* This fuel is compatible for storage with UDMH, anhydrous ammonia, anhydrous hydrazine, and hydrazine hydrate.

c. *Warning Signs.* Since this fuel contains UDMH, a warning sign similar to figure 44 should be posted at the entrance of each shelter storing it. The words *unsymmetrical dimethylhydrazine* may be modified as needed. Suggested dimensions and color scheme for this sign are the same as for those in figure 44. For further information on this warning sign, see paragraph 85c. In addition, a fire symbol 1 will be displayed on each storage shelter in accordance with TM 9-1903.

d. *Special Handling Instructions.* Rough handling of the fuel containers must be avoided. Drums should not be rolled since this will damage the stacking lugs. Retain drums on pallet during handling if possible. For further handling instructions, see paragraph 85d.

e. *Firefighting.* For instructions on firefighting, see paragraph 85e.

87. IRFNA

a. *Storage Requirements.* Under no conditions will IRFNA be stored in the same shelter with any fuel or other combustible material. Drums must be stored away from the direct rays of the sun and from heat sources. They must be stored with bungs up and arranged in such a manner that any container can be inspected or removed without moving more than two other drums. Aluminum dunnage is pre-

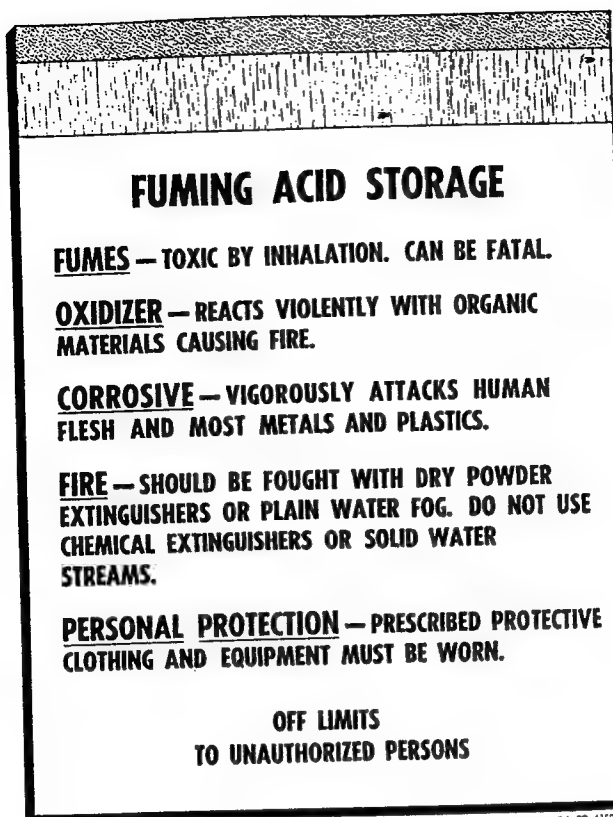


Figure 45. Suggested warning sign for IRFNA storage structures.

ferred, but steel dunnage is permissible if it is coated with acid-resistant paint. For information on storage shelters, see paragraphs 77 and 78.

b. *Compatibility.* IRFNA is compatible for storage with nitric acid, and mixed acid (nitric and sulfuric).

c. *Warning Signs.* A warning sign similar to that in figure 45 should be posted to the right of each entrance of the shelters storing IRFNA. The dimensions and color scheme for the sign are the same as those suggested in paragraph 85c except that the 2-inch stripe of paint will be ~~blue~~ brown and the 4-inch stripe of paint will be green.

d. *Special Handling Instructions.* Proper indoctrination is essential for personnel handling nitric acid. Individuals must be taught the nature of hazards, how to avoid exposure, the importance of maintaining good health, and what to do in the event of an accident.

- (1) In all operations involving the handling of nitric acid, personnel will wear protective clothing commensurate with the hazards involved. Table III lists

recommended minimum protective clothing for various operations.

- (2) A solution of sodium bicarbonate to neutralize any acid spilled on the skin and adequate water supplies to decontaminate any spills or leaks must be available at all handling sites.
- (3) Drums of nitric acid will be handled carefully at all times to minimize the hazards which are inherent in this acid. To avoid rupturing, drums should not be rolled if at all possible. However, should it become necessary to roll drums of acid, the bungs should be checked to see that they are secure;

and the rolling should be done slowly and carefully. Containers must remain in a vertical position during storage.

e. Firefighting. Fires involving IRI should be fought with large amounts of water. The area immediately around the flames should be thoroughly wet down to prevent the spread of the fire. Water, fog, and mist are helpful but as many water line streams as possible are the most effective means of fighting fires of this nature. Smothering or blanketing agents should not be used. To avoid smoke and fumes, firefighters should approach the flames from the windward side, and they must wear full protective clothing and self-contained breathing apparatus.

Section V. SHIPMENT

88. General

a. This section pertains to the regulations on shipment and transportation of missile components offered for shipment by common carrier. These components must be marked with proper shipping name and must be labeled as required. Shipments made by military installations must comply with these regulations.

b. The shipment of classified components must be in accordance with AR 380-55.

c. Missile components are costly; accordingly, dunnage will *not* be nailed to the containers.

89. Regulations, Requirements, and References

a. *Military.* A list of military references is given at the end of this manual.

b. *Nonmilitary.* Regulations for transportation and shipment of missile components by rail, motor vehicle, air, and water are as follows:

- (1) *Code of Federal Regulations, 1949 Edition (1950 Revision), Title 49—Transportation.* (Parts 71 to 90 containing the Interstate Commerce Commission regulations governing the transportation of explosives and other dangerous articles and specification of approved containers.) These regulations cover the inspection of freight cars prior to loading, blocking and bracing of shipments, placarding of cars, labeling of packages, and inspection of shipments

- prior to unloading as well as the quantities of items allowed in express shipments. These regulations are also published in various freight tariffs.
- (2) *Interstate Commerce Commission Motor Carrier Safety Regulations, Revision of 1952.* These regulations establish rules and regulations for operating commercial vehicles and provide operative information applicable to common carriers, private carriers, "exempt" carriers.
- (3) *Bureau of Explosives Pamphlets 6 and 6A.* These publications prescribe some of the methods of loading, blocking, and bracing of carload and less-than-carload (LCL) shipments of explosives and other dangerous articles.
- (4) *Rules and Regulations for Military Explosives CG 108, U. S. Coast Guard.* These regulations govern the stowage, loading compatibility, and dunnage requirements for explosives in merchant vessels and define the hazards which may be encountered.
- (5) *Explosives or Other Dangerous Articles on Board Vessels CG 187, U. S. Coast Guard.* These regulations govern the transportation, storage, and stowage of explosives or other dangerous articles on board vessels.
- (6) *Official Air Transport Restricted Articles Tariff No. 6A.* These regulations

govern the shipment of all dangerous articles by civilian aircraft.

- (7) *Department of the Army TB 59-1*. This publication governs the transportation, packaging, and handling of dangerous materials for military aircraft (including the Military Air Transport Service).

c. *Local, State, and Municipal Laws; Port and Harbor Regulations*. Most States and municipalities have laws or ordinances regulating the transportation of explosives and other dangerous articles within their legal jurisdiction. Shipments of missile explosive components or other dangerous articles through such areas will comply with these regulations where applicable.

d. *Miscellaneous*. SM 9-5-1336 lists appropriate loading drawings for explosive components. For information on ICC nomenclature of missile components, see table X.

90. Loading and Unloading Rail Shipments

a. For general instructions, see TM 9-1903.

b. Loading and unloading of liquid propellants shall be performed in areas specifically established for that purpose or at storage sites conforming to quantity-distance requirements.

c. The following general regulations will be observed during loading and unloading operations:

- (1) Necessary warning signs must be placed at all approaches and must remain in place until operation is complete.
- (2) Handbrakes must be set.
- (3) Liquid propellants must be loaded as follows:
 - (a) Pallets of propellant mixture must not be loaded more than three tiers high in boxcars.
 - (b) Drums of IRFNA shall not be loaded more than one tier high in railway cars. *See C-2*
 - (c) Boxes of UDMH will be loaded, blocked, and braced in accordance with applicable Ordnance Corps loading drawings.
- (4) Smoking will not be permitted in storage area except at approved sites, and in no instance within 50 feet of the loading or unloading operations.

- (5) Appropriate protective clothing for operations must be worn and a complete set of protective clothing including an approved type self-contained breathing apparatus must be immediately available at the site. A quick-opening shower or equivalent (portable water tank with hose in ready position) must also be provided. For necessary first aid and decontamination information, see table V and paragraphs 96 through 100.

d. An inspection will be made of the blocking, bracing, and stowing of incoming cars. The condition and serviceability of packaged missile components will also be made at this time. All shipments not received in proper condition will be reported through channels to the Chief of Ordnance on DD Form 6 in compliance with AR 700-58.

e. All dunnage and debris must be removed and the floor swept before cars are released to the carrier. Sweepings and debris containing flammable or explosive materials will be burned or placed in a metal receptacle for later disposal.

f. SR 55-155-1 requires all installations to unload freight as quickly as feasible in order to prevent payment of demurrage or detention charges.

91. Railway Express Shipment

a. Propellants may be transported by railway express when packaged and labeled in accordance with applicable ICC regulations.

b. Railway express shipments of UDMH are limited to 5 pints per shipping container. In addition, railway express cars must have suitable protection to prevent contact of lading with hot steam pipes or heat exits of electric heaters. If an employee occupies the car, no placards are required. Unoccupied cars must display DANGEROUS placards on both sides and ends.

92. On-Post Transportation of Liquid Propellants

Government owned vehicles used for on-post movement of liquid propellants will be equipped with two carbon dioxide fire extinguishers of at least 4-pound capacity each. One of these should be mounted outside the vehicle on the driver's side and the other in the cab. At least two of the

appropriate fire symbols will be displayed on the vehicle, one on each side of the body. Trucks used for such transportation should have steel bodies to facilitate decontamination in case of spills. Drivers of all vehicles should be instructed to stay on authorized roads, to observe speed limits, and to comply with all regulations pertaining to movement of liquid propellants.

93. Motor Vehicle Shipments

a. All motor vehicle shipments of propellants must comply in full with applicable portions of ICC, State, and municipal laws. General information on motor vehicle shipment by common carrier can be found in TM 9-1903.

b. All vehicles used to ship missile components must be inspected in compliance with AR 55-225; DD Form 626 will be prepared as prescribed by this regulation.

c. During loading and unloading, wheels should be chocked. Gangways should be provided when the vehicle body is not flush against the dock or platform. After loading, the vehicle will be closed, sealed, and, if applicable, placarded in accordance with ICC regulations. Dunnage and blocking securing the load in the trailer *will not be nailed to metal floors*, and dunnage will *not be nailed* to the containers. Trailer doors and magazine doors must remain closed until the engine of the vehicle has stopped. A permanent record will be made of the owner and serial number of the vehicle. For general loading and unloading instructions, see the applicable portions of paragraph 90.

Note. Trailer-flatcar or "piggy back" movements of missile components will not be made.

d. The carrier is responsible for advising the loading personnel of the maximum gross weight and the axle distribution weight for vehicles.

Loading personnel will see that lading does not exceed these weights or the indicated capacity (load limit) of the vehicle. The inspector checks the "vehicle is not overloaded" on Form 626 when he is assured that it is not. The signature does not indicate that the gross weight of the vehicle complies with State and municipal laws; it indicates only that the vehicle has been loaded in accordance with the weight limits furnished by the carrier. If trucks are available, the carrier can weigh the load on the vehicle before release. Overloaded vehicles have lading adjusted.

e. Vehicles transporting over 2,500 pounds gross weight of liquid propellants will be marked and placarded in accordance with AR 55-225 and applicable ICC regulations. Vehicles carrying less than 2,500 pounds do not require placards. Trucks or semitrailers should be of the closed type; however, if an open-top type truck or trailer is used, the sides should be solid and the top should be covered by a sparkproof, fire-resistant material. The drivers of vehicles transporting liquid propellants are governed by Motor Carriers Safety Regulations, with which all drivers should be familiar. Before leaving installations, they will also be informed of the nature of their cargo, its hazards, and the procedures to follow in case of fire or accident.

94. Loading Compatibility of Components at Rail and Motor Shipment

a. Markings, labels, and placards required for rail and motor shipment of the missile components are given in table X.

b. Loading compatibility of missile components for shipment by rail or motor is shown in table XI.

Table X. Markings, Labels, and Placards Required.

Shipment of Missile Components by Rail or Motor

Components	Required markings (ICC nomenclature)	Shipment by motor or rail (ICC requirements)	
		Label	Placard
ANTENNA: GS 18114	None	None	None
BATTERY, STORAGE: BB-401/U	None	None	None
BODY, GUIDED MISSILE: M2 or XM2	None	None	None
DELAY LINES	None	None	None
EXPLOSIVE HARNESS ASSEMBLY, GUIDED MISSILE: M24 and M45.	Boosters Explosive	None	Explosive
FIN, GUIDED MISSILE: M9, M10, and M12	None	None	None
IGNITER, JATO, ELECTRIC, M24 <i>or M65</i>	Igniter, Jet Thrust, Class A Explosives.	None	Explosive
JATO UNIT, GUIDED MISSILE: M5	Jet Thrust Unit, Class <i>B</i> Explosive	None	Explosive <i>Dangerous</i>
NITRIC ACID, GUIDED MISSILE: IRFNA	Corrosive Liquid	White (DA Form 55-137) ¹	Dangerous ²
PROPELLANT MIXTURE, GUIDED MISSILE: M3	Flammable liquid	Red (DA Form 55-132) ¹	Dangerous ²
SAFETY AND ARMING DEVICE, GUIDED MISSILE: M27, M30, or M30A1.	Percussion Fuse	None	None
STARTING MIXTURE, GUIDED MISSILE: UDMH	Flammable Liquid	Red (DA Form 55-132) ¹	Dangerous ²
THRUST STRUCTURE, JATO, GUIDED MISSILE: M2	None	None	None
WARHEAD, GUIDED MISSILE: M2, M3, or M4	Explosive Projectile	None	Explosive

- ¹ Where railway express, less-than-carload, or less-than-truckload shipments are made, these labels must have the shipper's name placed in the space provided.
- ² Truckloads or less than 2,500 pounds gross weight do not require placards. See Section 77.823(a) of the ICC Regulations.

Table X1. Loading Compatibility for Missile Components for Rail and Motor Shipment
(The letter X indicates that these items must NOT be loaded or stowed together.)

Component	Antenna: GS 18114	Battery, storage: BB-401/U	Body, guided missile: M2 and XM2.	Delay lines	Explosive harness assembly, guided missile: M24 and M45.	Fin, guided missile: M9, M10, and M12.	Igniter, jato, electric, M24 ¹	Jato unit, guided missile: M5 (w/or w/o igniter)	Nitric acid, guided missile: IRFNA.	Propellant mixture, guided missile: M3.	Safety and arming device, guided missile: M27, M30, and M30A1.	Starting mixture, guided missile: UDMH.	Thrust structure, jato, guided missile: M2.	Warhead, guided missile: M2, M3, and M4.
ANTENNA: GS 18114 BATTERY, STORAGE: BB-401/U. BODY, GUIDED MISSILE: M2 and XM2. DELAY LINES EXPLOSIVE HARNESS ASSEMBLY, GUIDED MISSILE: M24 and M45. FIN, GUIDED MISSILE: M9, M10, and M12. IGNITER, JATO, ELECTRIC: M24. ¹ JATO UNIT, GUIDED MISSILE: (w/ or w/o igniter). NITRIC ACID, GUIDED MISSILE: IRFNA. PROPELLANT MIXTURE, GUIDED MISSILE: M3. SAFETY AND ARMING DEVICE, GUIDED MISSILE M27, M30, and M30A1. STARTING MIXTURE, GUIDED MISSILE: UDMH. THRUST STRUCTURE, JATO, GUIDED MISSILE: M2. WARHEAD, GUIDED MISSILE: M2, M3, and M4.														
					X		X	X	X	X		X		X
									X	X		X		X
					X		X	X	X ²					X
							X	X	X ²					X
					X ²		X	X	X ²					X
									X	X		X		

¹ Igniters shipped in same container with jato M5 are considered the same as the jato for compatibility.

² For safety reasons it is recommended that these items not be loaded, or shipped in the same vehicle; such loading is NOT restricted by ICC regulations.

Note. Loading of additional compatible items within the same transporting vehicle is permitted provided the loading and bracing is in compliance with an approved drawing. The securement method(s) prescribed by approved Ordnance Corps drawings is mandatory. If basic drawing calls for one container high, six containers per train, then additional items, if container may be loaded on the vehicle, but not on top of the container and method of securement must be similar.

95. Decontamination of IRFNA Drums Prior to Shipping *See Cr.*

- a. Empty drums will be inspected for freedom from contamination by dirt and foreign materials.
- b. Outside of the drum will be thoroughly flushed with water.

See Cr.
Note. Do not allow water to enter the drum.

c. In less-than-carload and less-than-truckload shipments, the CORROSIVE LIQUID label will be completely covered by the EMPTY label delineated in section 73.413(a) of the ICC Regulations.

d. Each bung cap will be securely tightened and sealed with a standard lead car seal.

Section VI. DECONTAMINATION

96. General

a. This section contains procedures for the decontamination of equipment and missile components contaminated by liquid propellants. It also gives decontamination procedures for spills in storage and handling. For decontamination of protective clothing, see table IV.

b. Decontamination solutions for equipment and components must be kept fresh. Vats or tanks for decontamination of components should be locally fabricated.

c. Immediate and thorough decontamination of equipment, missile components, and spills is essential.

97. Decontamination of Equipment

a. *UDMH*. Flush external surfaces with clear water; wash with dilute acetic acid; then rinse thoroughly in clear water and dry. Personnel engaged in decontamination operations must wear appropriate protective clothing. For further information on protective clothing required during decontamination, see table III.

b. *Guided Missile Propellant Mixture M3*. Instructions for the decontamination of equipment contaminated by rocket engine fuel M3 are the same as those for UDMH found in a above.

98. Decontamination of Fuel Spills

a. *UDMH*. The most practical method for neutralizing UDMH spilled on the ground is repeated flushings with large amounts of water or a dilute solution (approximately 5 percent) of commercial acetic acid. For protective clothing to be worn during decontamination, see table V.

b. *Guided Missile Propellant Mixture M3*. Follow procedures outlined in a above.

99. Decontamination of IRFNA Spills

The most suitable method of neutralizing acid spilled on the ground is to dilute the acid with a large amount of water. Since IRFNA will spatter and fume violently when diluted with water, extreme care should be exercised to prevent inhalation of fumes or contact with the acid. The reaction of acid when diluted with water can be minimized by spraying the contaminated area. After spattering has ceased, large quantities of water may be used as necessary. In extremely large spills where neutralization of acid by water alone is not feasible, slaked (hydrated) lime or a water solution of sodium bicarbonate may be used before the area is flushed with water.

100. Decontamination of Drums for Propellant Mixture M3

a. The drums used to ship fuel M3 are not returnable and will be salvaged after use. Before being salvaged, these drums must be thoroughly decontaminated. Either of the following methods, depending upon local conditions, may be used for this decontamination.

- (1) Drum caps should be removed and drums placed in a bungs-down position. Steam and hot water forced into the drum for a period of three to five minutes should adequately remove all traces of this fuel.
- (2) Drums may be placed on a rack in a bungs-down position with caps removed and wood or other combustible material ignited (as described in paragraph 106b) directly under the drums. This

Von C2

fire should be allowed to burn from five to ten minutes to assure complete decontamination.

b. After either of the above operations have been completed, the drums must be certified as being free of contamination in accordance with

Von C2

AR 755-5. The responsible officer will sign a certificate indicating that the drums have been inspected and are free of hazardous material.

Note. The handling of drums and caps and the decontamination operation will be conducted in accordance with the safety regulations listed in paragraphs 82 and 83.

CHAPTER 6

DESTRUCTION OF MATERIEL

Section I. DESTRUCTION OF MATERIEL IN ZONE OF THE INTERIOR

101. General

a. These instructions apply only to limited quantities of explosive components and liquid propellants found to be unserviceable, hazardous, or unsalvageable at posts, camps, and stations. However, they may be used as a guide by other installations.

b. Lumber contaminated by explosives or liquid propellants that cannot be readily decontaminated should be destroyed by burning. When lumber contaminated by liquid propellants is being burned, proper protective clothing and equipment must be used if health or safety hazards exist.

102. Report of Destruction *See C2*

Before explosive components are destroyed, report will be made through channels to the Chief of Ordnance. In the case of components which offer immediate danger to life or property, the local commanding officer may order immediate destruction. For further information on Ammunition Condition Reports, see paragraph 3f.

103. Methods

Explosive components will be destroyed by burning, demolition, or mechanical methods. Liquid propellants will be destroyed by burning or neutralization. Methods of demolition are described in detail in FM 5-25. These items will not be disposed of by burying or dumping in waste places, pits, wells, marshes, shallow bays, or inland waterways. Methods of destruction are dictated by the nature, size and number of units to be destroyed; the facilities available; and the topography of the land designated as the destruction area.

104. Materials Used in Destruction by Demolition

TNT and Composition C are used for demolition purposes. These explosives must be set off by either time fuse (safety fuse) and a blasting cap, or by a blasting machine and an electric blasting cap. Nitrostarch may be used as a substitute for TNT, but must *NOT* be broken or crushed as it is very sensitive to friction and impact. Further information on these materials can be found in SM 9-5-1375, TM 9-1903, and TM 9-1946.

105. Materials Used for Destruction by Fire

Fires for the destruction of explosive components may be made from scrap lumber, wood, or excelsior. Such fires may be lit from a safe distance by a train of flammable material or by a class 2 solid propellant train ignited with an electric squib. Destruction of liquid propellants by fire is discussed in paragraph 108a and b.

106. Safety Precautions

a. The safety precautions to be observed in the destruction of explosive components are listed in TM 9-1903.

b. Safety precautions to be observed in destroying liquid propellants are as follows:

- (1) The disposal site should be isolated from inhabited buildings, railroads, public highways, navigable streams, and storage and operating areas.
- (2) Separate disposal areas should be maintained for fuels and oxidizers.
- (3) Burning pans and disposal pits should be located in areas where prevailing winds will blow toxic fumes away from inhabited areas and where there

is no danger of the contamination of water supplies. The disposal site should be fenced and placarded.

- (4) The disposal area should be free of all combustible material.
- (5) Safety showers or other suitable means of decontamination must be available for personnel at disposal sites.
- (6) Protective clothing and equipment prescribed for use in disposal operations must be worn by personnel involved in such operations. For further information on the use of protective clothing, see table III.
- (7) Accumulation of containers of fuels or oxidizers near burning areas will not be permitted.

107. Explosive Components

a. Safety and Arming Devices. Safety and arming devices are to be destroyed by demolition or burning in accordance with instructions included in TM 9-1903 for the destruction of small explosive components, such as grenade fuzes, boosters, detonators, and similar material.

b. Explosive Harness Assembly and Warhead Initiators. These components may be destroyed by detonating as outlined in *a* above.

c. Jato Igniter. Jato igniters will be burned.

d. Warheads. Warheads should be destroyed by detonation. They should be placed in a pit at least 4 feet deep and covered with earth. If practicable, warheads should be detonated by an explosive harness lead initiated by the method described for primacord in FM 5-25. If explosive harness leads are not available and the initiator assembly can be removed, the M3 and M4 warheads can be detonated by inserting a coil of primacord (pig tail) into the initiator well until it touches the tetryl booster, packing the void with Composition C, attaching a blasting cap to the primacord lead, and initiating it as described in FM 5-25. If difficulty is encountered in removing initiator, place a quantity of Composition C in contact with initiator and detonate warhead using a primacord lead and a blasting cap as described in FM 5-25.

e. Jato. The destruction of jatos at post, camp, and station level is not feasible because of the special equipment needed to remove the grain. Those installations having jatos to be destroyed

will report them in accordance with SR 755-140-1.

108. Disposal of Liquid Propellants

a. Disposal of UDMH. Small quantities (c bottle) of UDMH may be disposed of at post camps, and stations by burning with the limitation of a minimum separation of 400 feet from inhabited buildings, public highways, public railways, navigable streams, storage areas, and other intensively utilized areas. UDMH can be disposed of by burning in a shallow metal pan. UDMH will be ignited by utilizing a train of combustible material such as excelsior and igniting the combustible train in the direction from which the wind is blowing. The train of combustible material must be of sufficient length to provide adequate protection to personnel.

b. Disposal of Guided Missile Propellant Mixture M3. One drum of this fuel at a time may be destroyed by burning at posts, camps, and stations. The same procedure is used as outlined in *a* above, with the exception that there must be a minimum distance of 1,000 feet between the burning pan and inhabited buildings, public highways and railways, navigable streams, storage areas, and other intensively used areas. The fuel will be ignited by utilizing a train of combustible material, such as excelsior, and lighting the combustible train in the direction from which the wind is blowing. The train must be of sufficient length to provide adequate protection to personnel. Personnel will not be permitted to work alone. Appropriate protective clothing will be worn during disposal operations, and all prescribed protective equipment will be immediately available in proper working order. For further information on the wearing of protective clothing and equipment during disposal operations, see table III.

Warning: Personnel not in full protective clothing must remain at least inhabited building distance upwind from the disposal site. *Join Ca*

c. Disposal of Unserviceable Acid. The disposal of appreciable quantities of nitric acid presents complex problems in engineering and public health. Therefore, extreme care must be exercised not only in the selection of the disposal site to prevent the contamination of water source and the subjecting of inhabited areas to the hazards of fumes but also to prevent accidents to operating personnel.

(1) *Site.*

(a) The site selected for disposal of limited quantities of acid should be a minimum of 2,400 feet from reservation boundaries, inhabited buildings, public railways and highways, and areas where people congregate. The same distance should separate selected sites from inland lakes, rivers, or water used for drinking purposes.

(b) The immediate area where disposal operations are conducted should be completely fenced and should have applicable warning signs posted advising personnel of the hazards present.

(2) *Trench.* A trench approximately 4 feet wide, 30 feet long, and 4 feet deep should be used for the disposal of the acid. The trench should be filled to approximately one-half of the total depth with pulverized limestone or slaked lime. The slaked lime or limestone should be completely covered with water to allow the acid to be introduced into the trench under the water. Personnel emptying container into the trench should stand as far upwind as possible and should be equipped with complete protective clothing and adequate respiratory equipment. For further information on protective clothing and equipment, see chapter 4.

Section II. DESTRUCTION OF MATERIEL TO PREVENT ENEMY USE

109. General

a. Destruction of the missile or its components within the combat zone to prevent enemy capture and use will be done only upon orders of the unit commander to comply with orders of, or policy established by, the army commander.

b. The following information is for guidance only. The conditions dictating destruction of missiles or components are command decisions and may vary with the tactical situation, security classification of the item, quantity and location of items, facilities available, and time. For further information on security classification and the protection of classified items and information, see AR 380-5. In general, missiles and components can be most effectively destroyed by demolition, burning, mechanical destruction, or a combination of these methods. Selection of the proper method of destruction depends upon the resourcefulness of the personnel concerned and the means and time available.

c. If destruction becomes necessary, missiles and components must be so thoroughly wrecked that use or restoration to serviceable condition cannot be accomplished in the combat zone. It is important that the same *essential* components in each missile be destroyed to prevent the enemy from assembling complete missiles by cannibalization of usable components. All classified components must receive top priority in destruction.

d. During destruction procedures, due consideration must be given to—

- (1) Destroying items in a manner that hinders the enemy in every way possible without endangering the lives of friendly troops or materiel.
- (2) Taking proper safety precautions to prevent injury or death to personnel involved in destruction work.

110. Destruction Plan

Each installation where the missile or missile components are maintained or stored should have a standing operating procedure (SOP) for destruction of these items. The SOP should include priorities of materiel to be destroyed, methods of destruction, and quantities of explosives required, with instructions for placement and use of demolition material. This plan must be flexible enough to work in any situation.

a. All instructions and procedures must be planned so that maximum destruction can be accomplished in minimum time. Adequate destruction of missile or missile components means that all items essential to operation, including repair parts, must be destroyed or damaged beyond repair.

b. Plans for destruction must be written so that each succeeding step adds to the damage in such a way as to render the item completely irre-

parable. Plans must also be made to use whatever means are available if standard demolition or other means of destruction are unavailable. Particular attention must be given to destroying fuels and power sources as early as possible.

111. Demolition Materials

For information on demolition blocks, charges, equipment, sets, and kits, see TM 9-1946.

112. Destruction Methods

Priority of methods of destruction is as follows:

a. Method No. 1—Destruction By Demolition. In destruction of the complete round missile, the missile in any assembled state, or any components (packaged or unpackaged), the use of explosives is the most effective means, but is utilized only when adequate time and explosives are available. This type of destruction requires careful consideration, especially when high explosive warheads or jatos are involved, since the large quantities of explosives may produce many high velocity fragments and precautions must be taken to protect operational personnel and friendly troops from both fragments and blast. All personnel concerned must be familiar with the pertinent provisions of FM 5-25 to assure the observance of all safety precautions as well as the successful execution of methods of destruction involving the use of demolition materials.

b. Method No. 2—Destruction By Burning. Items to be destroyed by burning should be stacked on beds of readily combustible material, such as dry wood, and ignited by a combustible train. Readily flammable fuel and oils from motor vehicles may be poured over the stack of items to be destroyed to assist ignition and to assure more complete destruction. When destroying explosive components, precautions must be taken to assure complete evacuation of the area by friendly troops and operating personnel since the items may detonate during the operation. Igniters must be removed before jatos are burned to render them nonpropulsive. After maximum

damage by demolition or mechanical means has been accomplished, it is often advisable to complete the destruction of the item by burning the resulting debris.

c. Method No. 3—Destruction By Mechanic Means. This method, which involves breaking or mutilating the components with axes, sledges, or similar implements, will be attempted only on those inert (nonexplosive) components which are not assembled to the missile. If time permits, destruction will be completed by burning as described in *b* above.

d. Method No. 4—Destruction By Gunfire. (This method should be used only as a last resort.) The assembled missile or its components (packaged or unpackaged) may be destroyed by artillery fire or antitank rockets. Inert components may also be destroyed by rifle or by rifle grenades. When firing artillery or antitank rockets at explosive components at a range of 500 meters or less, adequate cover to protect operating personnel from fragments must be utilized.

113. Priorities of Destruction

a. Priority of Method. Paragraph 112 set forth the recommended priority of method. However, the method selected must be the method most suitable for use in the situation encountered. In choosing the proper method, consideration must be given to such factors as the local deployment of friendly troops, the availability of personnel and materials required to accomplish destruction, the time available, etc.

b. Priority of Item. In order to accomplish effective destruction, the same item from all missiles on hand should be destroyed before destruction of other components is attempted. All classified components must receive top priority in destruction. The following priority of items to be destroyed is considered the most effective in rendering the missile unfit for use:

- (1) Missile body.
- (2) Jato unit.

APPENDIX REFERENCES

1. Publications Indexes

DA pamphlets of the 310-series and DA Pam 108-1 should be consulted frequently for the latest revision of or changes to references given in this appendix and for new publications relating to the missile or its components.

Index of Administrative Publications	DA Pam 310-1
Index of Army Motion Pictures, Film Strips, Slides, and Phono-Recordings	DA Pam 108-1
Index of Blank Forms	DA Pam 310-2
Index of Graphic Training Aids and Devices	DA Pam 310-5
Index of Supply Manuals—Ordnance Corps	DA Pam 310-29
Index of Supply Manuals—Quartermaster Corps	DA Pam 310-30
Index of Supply Manuals—Signal Corps	DA Pam 310-21
Index of Tables of Organization and Equipment, Tables of Organization, Type of Tables of Distribution, and Tables of Allowances.	DA Pam 310-7
Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.	DA Pam 310-4
Index of Training Publications, (Field Manuals, Reserve Officers Training Corps Manuals, Training Circulars, Army Training Programs and Mobilization Train- ing Programs, Army Subjects Schedules, Army Training Tests, War Depart- ment and Department of the Army Posters and Firing Tables and Trajectory Charts).	DA Pam 310-3
Introduction	ORD 1

2. Supply Publications

The following Department of the Army supply manuals pertain to the missile and related components:

Battery, Storage BB-401/U	SIG 7 & 8 BB-401/U
Clothing, Special Purpose	SM 10-1-8415
Stock List of All Items, Price List, FSC Group 13, Ammunition and Explosives; Class 1336, Guided Missile Warheads and Explosive Components.	SM 9-2-1300
Stock List of All Items, Price List, FSC Group 14, Guided Missiles; Class 1410, Guided Missiles; 1420, Guided Missile Components; 1430, Guided Missile Remote Control Systems; 1440, Launchers, Guided Missile; 1450, Guided Missile Han- dling and Servicing Equipment.	SM 9-2-1400
Stock List of All Items, Alphabetical List, FSC Group 81, Containers, Packaging, and Packing Supplies; Class 8105, Bags and Sacks; 8110, Drums and Cans; 8115, Boxes, Cartons, and Crates; 8125, Bottles and Jars; 8135, Packaging and Packing Bulk Materials.	SM 10-1-8100
Stock List of All Items, except Repair Parts, FSC Group 14, Guided Missiles; Class 1410, Guided Missiles.	SM 9-1-1410
Stock List of All Items, FSC Group 81, Containers, Packages and Packing Sup- plies; Class 8140, Ammunition Boxes, Packages, and Special Containers.	SM 9-1-8140
Stock List of All Items, FSC Group 61, Electric Wire, and Power and Distribution Equipment; FSC Class 6140, Batteries, Secondary.	SM 9-1-6100

Stock List of All Items, FSC Group 14, Guided Missiles.....	SM 9-1-1400
Stock List of All Items, Price List, FSC Group 81, Containers, Packaging, and Packing Supplies; Class 8105, Bags and Sacks; 8110, Drums and Cans; 8115, Boxes, Cartons, and Crates; 8120, Gas Cylinders; 8125, Bottles and Jars; 8130, Reels and Spools; 8135, Packaging and Packing Bulk Materials; 8140, Ammunition Boxes, Packages, and Special Containers.	SM 9-2-8100
Stock List of Current Issue Items, Ammunition Explosives, Bulk Propellants, and Explosive Devices; Federal Supply Class 1375.	SM 9-5-137
Stock List of Current Issue Items, Ammunition Guided Missiles; Federal Supply Class 1410.	SM 9-5-1410
Stock List of Current Issue Items, Ammunition, Guided Missile Warhead and Explosive Components; Federal Supply Class 1336.	SM 9-5-1336
Stock List of Current Issue Items, Class 9100, Fuels, Lubricants, Oils, and Waxes..	SM 10-5-9100
Stock List of Current Items, FSC Group 84, Clothing and Individual Equipment; Class 8415, Clothing, Special Purpose.	SM 10-5-8415
Stock List of Current Issue Items, FSC Group 84, Clothing and Individual Equipment; Class 8430, Footwear, Men's.	SM 10-5-8430
Stock List of End Items, Alphabetical List, FSC Group 13, Ammunition and Explosives; Class 1336, Guided Missile Warheads and Explosive Components.	SM 9-1-1336
Stock List of End Items, Alphabetical List, FSC Group 80, Brushes, Paints, Sealers and Adhesives; Class 8010, Paints, Dopes, Varnishes and Related Products; 8030, Preservative and Sealing Compounds; 8040, Adhesives.	SM 9-1-8010, 30, 40
Stock List of End Items, FSC Group 68, Chemicals, Gases Compressed and Liquefied; Pest Control Agents and Disinfectants; Miscellaneous Chemical Specifications.	SM 9-1-6800, 6810, 30, 40, 50

3. Forms

The following forms pertain to the materiel covered in this manual: DD Form 6, Report Damaged or Improper Shipment; and 00 Form 517, Ammunition Condition Report.

4. Other Publications

The following publications contain general information relevant to the materiel covered by this manual.

a. Ammunition.

Ammunition: Antiaircraft Guided Missile M1 (NIKE-AJAX) Field and Depot Maintenance.	TM 9-1970-2-35
Ammunition: General	TM 9-1900
Ammunition: Restricted or Suspended	TB 9-AMM-2
Ammunition: Supply Within the Continental United States	SB 9-AMM-6
Authority to Waive Ammunition and Explosives Quantity-Distance Safety Standards..	AR 75-85
Care, Handling, Preservation, and Destruction of Ammunition	TM 9-1903
Demilitarization and Disposal of Arms, Ammunition, and Implements of War	AR 755-70
Demolition Materials	TM 9-1946
Disposal of Supplies and Equipment: Ammunition	SR 755-140-1
Explosives and Demolitions	FM 5-25
Identification of Inert Ammunition and Ammunition Components	AR 385-65
JATOS: General	TM 9-1955
Military Explosives	TM 9-19
Ordnance Ammunition Service in the Field	FM 9-
Report of Malfunctions and Accidents Involving Ammunition and Explosives (During Training or Combat).	SR 700-45-6
Storage Battery BB-401/U	TM 11-5539

b. General.

Authorized Abbreviations	AR 320-50
Coordination with Armed Services Explosive Safety Board	SR 385-15-1
Dictionary of United States Army Terms	SR 320-5-1
Military Publications, General Policies	AR 310-1
Military Symbols	FM 21-30
Military Training	FM 21-5
Responsibility for Explosive Ordnance Disposal	AR 75-15
Safeguarding Defense Information	AR 380-5
Storage in the Zone of Interior	TM 38-402
Surplus Personal Property	AR 755-7
Techniques of Military Instruction	FM 21-6

c. Ordnance.

Explosive Ordnance Disposal, Commercial Shipments of Explosive Contaminated Scrap Metals	SR 75-15-10
Inspection of Ordnance Material in Hands of Troops	TM 9-1100
Instruction Guide: Ordnance Preservation, Packaging, Packing, Storage, and Shipping	TM 9-1005
Materials Used for Cleaning, Preserving, Abrading, and Cementing Ordnance Material and Related Materials including Chemicals, Lubricants, Indicators, and Hydraulic Fluids	TM 9-1007
Ordnance Service in the Field	FM 9-5
Ordnance Service within Major Commands	AR 220-59

d. Packing and Marking.

Color Code for Containers of Liquid Propellants	MIL-STD-172
Desiccants Activated (in Bags) for Static Dehumidification and Packaging	Mil-D-3464
Marking for Shipment and Storage	MIL-STD-129
Painting Instructions for Field Use	TM 9-2851
Preservation, Packaging, and Packing	AR 740-15

e. Reports.

Reports	SB 9-AMM-8
Report of Damaged or Improper Shipment	AR 700-58
Unsatisfactory Equipment Report	AR 700-38

f. Safety.

Accident Reporting (Reports Control Symbol CSGPA-147 (R))	SR 385-10-40
Health Hazards from Propellant Fuels and Oxidizers	TB MED 242, Ch 1
Precautions in Handling Gasoline	AR 850-20
Protective Clothing and Equipment	AR 385-32
Protective Clothing and Equipment for Individuals Handling Guided Missile Fuels	SB 725-8414-1
Protective Clothing for Handlers of Guided Missile Fuels and Oxidizers	TB 10-277
Protective Masks and Accessories	TM 3-205
Respiratory Protective Devices	TB MED 223

g. System.

Guided Missile System, XSAM-A-7 (NIKE-I), Missile and Booster Maintenance Notes, Vol. I (U). (Ord. Handbook No. 11.1).	TM 9-5001-22
Guided Missile System XSAM-A-7 (NIKE-I), Missile and Booster, Operators Notes, Vol. I, Assembly, Emergency Procedures, Shipment, and Limited Storage (U) (Ord. Handbook No. 10.1).	TM 9-5001-19
Guided Missile System, XSAM-A-7 (NIKE-I), Over-All System Operation (U), (Ord. Handbook No. 1).	TM 9-5001-1
Procedures and Drills for the NIKE-I System (O)	FM 44-80

h. Transportation.

Army Shipping Document	TM 38-70
Civil Aeronautic Authority Regulations, Official Air Transport Restricted Articles Tariff No. 6-A.	U. S. Civil Aeronautics Board
Code of Federal Regulations, Title 49—Transportation Parts 71 to 90, 1949 Edition (Revised 1950) with Amending Orders.	U. S. Gov't Printing Office
Explosives or Other Dangerous Articles on Board Vessels, CG 187	U. S. Coast Guard
Interstate Commerce Commission Motor Carrier Safety Regulations Revision of 1952.	U. S. Gov't Printing Office
Marking of Oversea Supply	SR 746-30-5
Military Guards and/or Technical Safety Escorts for Military Shipments	AR 55-201
Motor Carrier's Explosives and Dangerous Articles Tariff Number 9 publishing Interstate Commerce Commission Regulations for Transportation of Explosives and Other Dangerous Articles by Motor, Rail and Water: Including Specifications for Shipping Containers.	Issued by F. G. Freund, 1424 16th St., N. W. Washington 6, D. C.
Official Air Transport Restricted Articles Tariff No. 6-A	Emery F. Johnson, Agent National Airport Washington 1, D. C.
Pamphlet No. 6, Drawings and Photographs Illustrating Methods for Loading and Bracing Carload and Less-Than-Carload Shipments of Explosives and Other Dangerous Articles.	Bureau of Explosives 30 Vesey St New York 7, N. Y.
Pamphlet No. 6A, Illustrating Methods for Loading and Bracing Carload and Less-Than-Carload Shipments of Loaded Projectiles, Loaded Bombs, etc.	Bureau of Explosives 30 Vesey St New York 7, N. Y.
Preparation for Shipment	AR 740-20
Railway Operating Rules	TM 55-20
Rules and Regulations for Military Explosives, effective May 15, 1954	CG-108 U. S. Coast Guard
Safeguarding Defense Information in Movement of Persons and Things	AR 380-5
Tactical Motor Vehicle Inspections and Preventive Maintenance Services	TM 9-2810
Tariff No. 10 publishing Interstate Commerce Commission Regulations for Transportation of Explosives and Other Dangerous Articles by Land and Water in Rail Freight Service and by Motor Vehicle (Highway) and Water: Including Specifications for Shipping Containers.	Issued by H. A. Campbell, Agent 30 Vesey St New York 7, N. Y.
Bills of Lading and Related Procedures Governing Shipments by Commercial Means	SR 55-155-1
Transportation by Water of Explosives and Hazardous Cargo	AR 55-228
Transportation of Explosives and Other Dangerous Articles	AR 55-228
Transportation, Packaging, and Handling of Dangerous Materials for Military Aircraft	TB 59-

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By Order of *Wilber M. Brucker*, Secretary of the Army:

MAXWELL D. TAYLOR,
General, United States Army,
Chief of Staff.

Official:

HERBERT M. JONES,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

DCSLOG
CNGB
ASA
Technical Stf, DA
Ord Bd
USCONARC
USA Arty Bd
USA Armor Bd
USA Inf Bd
USA Air Def Bd
USA Abn Elct Bd
USA Avn Bd
US ARADCOM
OS Maj Comd
MDW
Armies
Corps
Div
Ord Gp
Ord Bn
Ord Co
Ft & Camps
Fld Comd AFSWP
Ord Ammo Comd
Svc Colleges
Br Svc Sch
USA Ord GM Sch
PMST Sr Div Ord Units
Gen Depots
Ord Sec, Gen Depots
Ord Depots

NG: State AG; units—same as Active Army.

USAR: None.

For explanation of abbreviations used, see AR 320-50.

Ports of Emb (OS)

Trans Terminal Comdr

Army Terminals

OS Sup Agency

Ord PG

Ord Arsenals

Mil Dist

Ord Proc Dist

MAAG

Mil Mis

JEUSMC

JUSMAG (Greece)

Units org under fol TOE:

9-12

9-17

9-45

9-46

9-47

9-57

9-227

9-229

9-377

9-500

9-510

19-177

44-145

44-146

44-147

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